Web/Java-Based Access to and Analysis of a Library of Clinical Outcomes Databases

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Background. Clinical outcomes (CO) analysis is becoming increasingly important. In many medical institutions, CO databases (CODs) are maintained by individual departments. Nursing and clerical personnel usually are assigned to maintain these departmental clinical outcomes databases. Analysis of the data commonly is impeded for many reasons.[1] With managed care's increasing share of the health care market, together with increasing interest in health services research, the value of being able to easily access and analyze this kind of data is becoming increasingly apparent. Toward this end, the author developed a prototypical web-based tool for performing Kaplan-Meier (K-M) survival analyses[4] on a sample set of four live MUSC CODs.

Materials and Methods. The tool was integrated into the HCC's existing web. The CODs, residing on multiple file servers distinct from the HCC web server, use various database management systems including Borland Paradox and Microsoft Access and FoxPro. Programming of database extraction and manipulation functions was done using Allaire, Inc.'s Cold Fusion Pro 2.0 package. JavaChart, a freeware Java graphing package by David McMurdie of Visual Engineering, Inc., was used as the basis of the in-browser K-M survival curve graphing feature.

Results. The core of the tool consists of two secured Cold Fusion templates, the form template and the analysis template. The form template is first processed by Cold Fusion into an HTML form allowing the user to define up to four subsets of patients from the target database based on clinically important database variables. The second template receives the form data, builds the corresponding SQL queries, and submits the queries to the ODBC interface to extract the desired data from the target database. The template then builds the output HTML page to first show the table(s) of raw data selected from the database, followed by the K-M calculations, and then the actual K-M survival curve(s) (superimposed if more than one). A new Java applet was coded to draw the K-M tick marks. After the templates were originally constructed for operating upon one database, they were copied and adjusted (about one hour of work) for each of the other CODs in this pilot. The only adjustments required in the copies related to the different variables in each database and the different clinical program names. Extraction, calculation, and graphing accuracy was verified for each COD.

Discussion. The tool can provide the MUSC investigator with K-M survival analysis functionality on a number of disparate CODs. Numerous barriers previously preventing the appropriately credentialed researcher from accessing these databases can be eliminated. The researcher now has a common interface to all of these databases using the familiar, easy-to-operate web paradigm. The process of adding other analytical functionality and other databases to the tool is straightforward. Barriers to the productive use of this tool include lack of a Java-enabled browser in the current MUSC universal workstation model, lack of printing support in the current version 1.0 of the Java Virtual Machine specification, problems with data coding and validity in each of the CODs, and data ownership issues.

Conclusion. Many small, specialty-focused CODs contain valuable data but are not easily accessible for analysis. The author developed a prototypical web-based tool for performing K-M analyses on one or more specific populations drawn from any COD selected from a COD library. Adding more CODs and more analytical functions is straightforward. Providing sophisticated analytical tools to CO investigators through simple, ubiquitously available interfaces may be one route to enhancing research productivity and improving institutions' recognition of clinical areas of excellence as well as clinical areas in need of improvement.

References

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